Benefits of the University of Kentucky Research Foundation Project

Clean Coal Power Initiative

Advanced Multi-Product Coal Utilization By-Product Processing Plant

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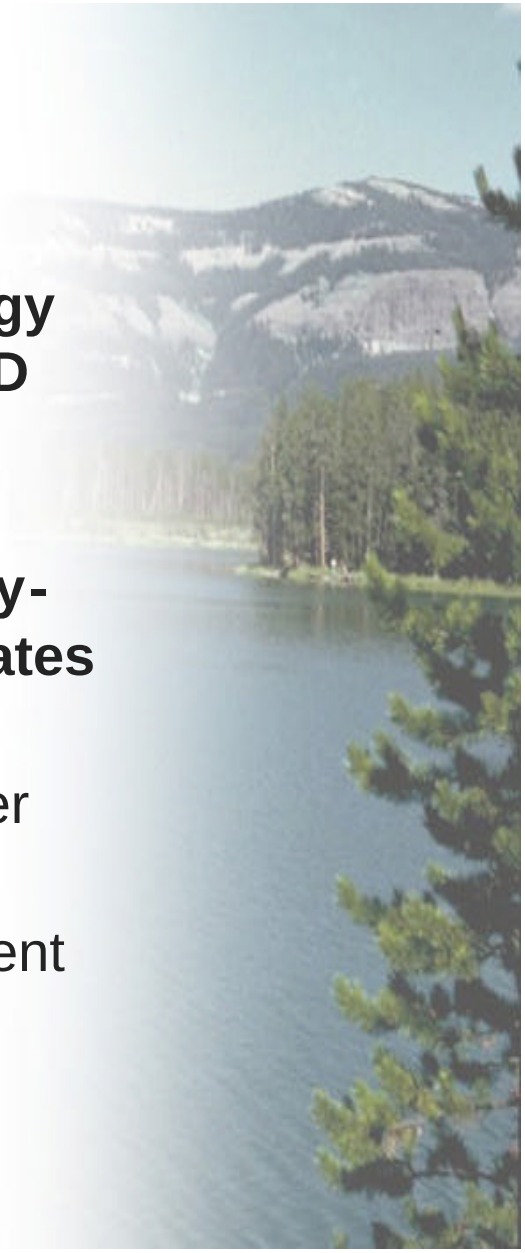
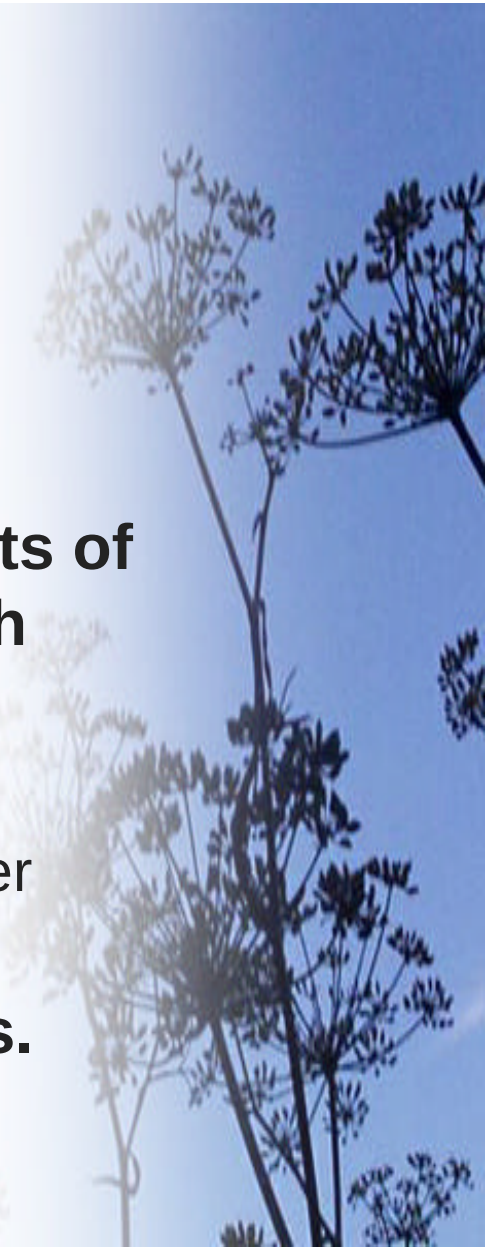
Executive Summary



- **Demonstration projects are critical to successful commercialization of technology developed under DOE's Fossil Energy R&D program.**
- **Successful commercial application of the Advanced Multi-Product Coal Utilization By-Product Processing Plant in the United States would:**
  - Allow commercial use of 2.3 million tons per year of coal utilization by-products
  - Reduce CO_2 emissions from portland cement production by 1.8 million tons per year

Outline



- **Description of the Advanced Multi-Product Coal Utilization By-Product Processing Plant.**
- **Quantitative estimates of the benefits of the University of Kentucky Research Foundation project.**
  - Benefits to the Nation
  - Benefits to LG&E Energy's Ghent Power Station
- **Approach used to calculate benefits.**

University of Kentucky Research Foundation Project

- Demonstration of an advanced coal ash beneficiation processing plant at LG&E Energy Corp.'s 2,000 MW_e Ghent Power Plant in Ghent, Kentucky.
- The plant represents the next generation in coal utilization by-product (CUB) beneficiation in that it addresses the entire CUB stream and generates a variety of useful products.
- Total project funding: $8,916,800

  DOE share: $4,450,200 (50%)

Advanced Multi-Product Coal Utilization By-Product Processing Plant

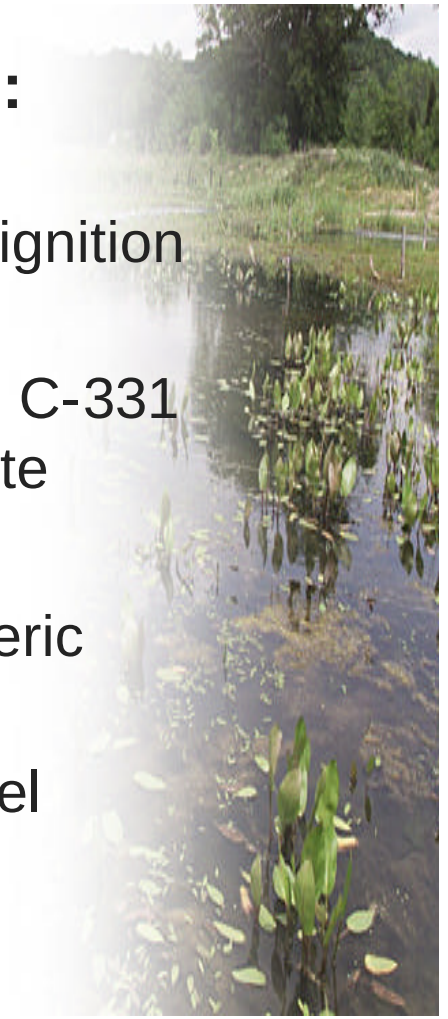
- **The technology can process ash that is either stored in existing disposal ponds or directly as it is produced by the power plant.**
- **Products are produced by physical beneficiation of coal-fired power plant ash using well-known techniques:**
  - Hydraulic classification
  - Froth flotation
  - Column flotation
  - Spiral concentrators
  - Solids dewatering

Advantages of Advanced Multi-Product Coal Utilization By-Product Processing Plant

- Increased use of ash to replace pozzolanic portland cement (30% vs. 20%).
- Improvement of local environments.
- Potential for greenhouse gas mitigation.

Performance at Ghent Power Plant

- **The demonstration plant will produce:**
  - 156,000 tons per year of pozzolan which exceeds ASTM C-618 criteria for loss on ignition (LOI), fineness, and strength
  - 16,000 tons per year of ASTM C-330 and C-331 compliant high grade lightweight aggregate
  - 16,000 tons per year of graded fill sand
  - 1,500 tons per year of high quality polymeric filler
  - 8,000 tons per year of recycled carbon fuel

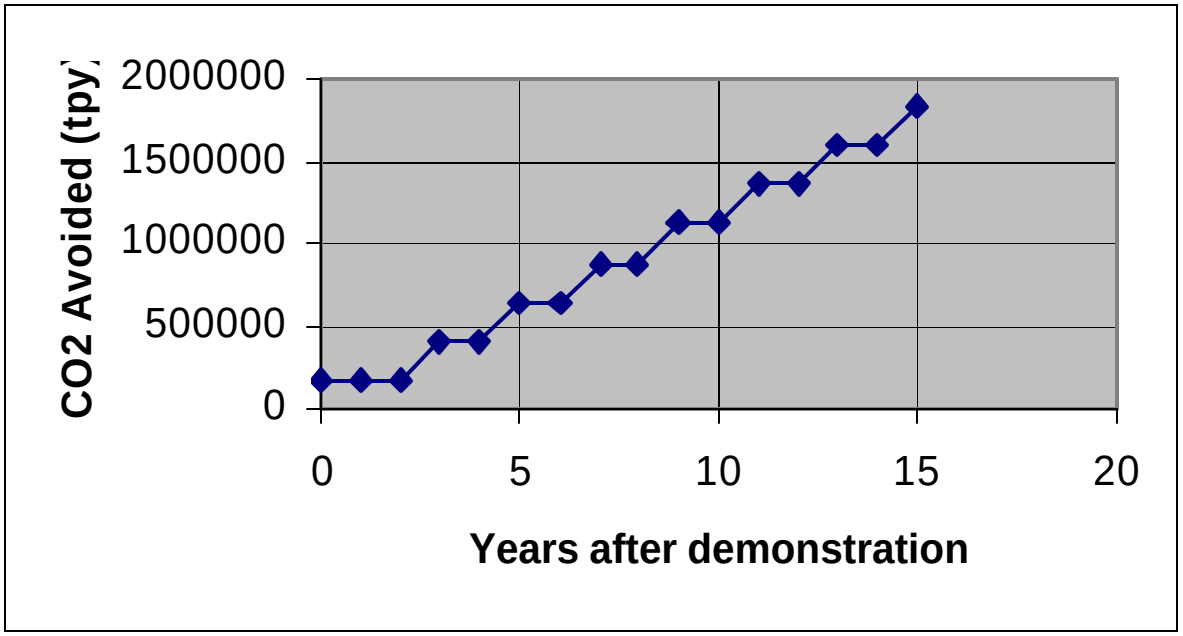


Competing Technology Options

- **Dry Tribo-Electrostatic Separation Processes**
  - High quality but low yield
  - Elevated NH_3 on ash from SCR interferes with electrostatic separation
  - Only addresses reduction of LOI in dry fly ash and requires extensive storage capacity for the product

National Benefits from Commercialization of the Technology

- **Based on construction of seven commercial-scale plants, 2.3 million tons per year of flyash would be utilized and 1.8 million tons per year of CO_2 would be avoided.**



Current Use of Coal Utilization By-Products

- There are 110 million tons of coal utilization by-product produced annually (currently 32% utilization).
- Commercial application of this technology would result in a 6% increase in the quantity of coal utilization by-product used.

Benefits of Technology for Ghent

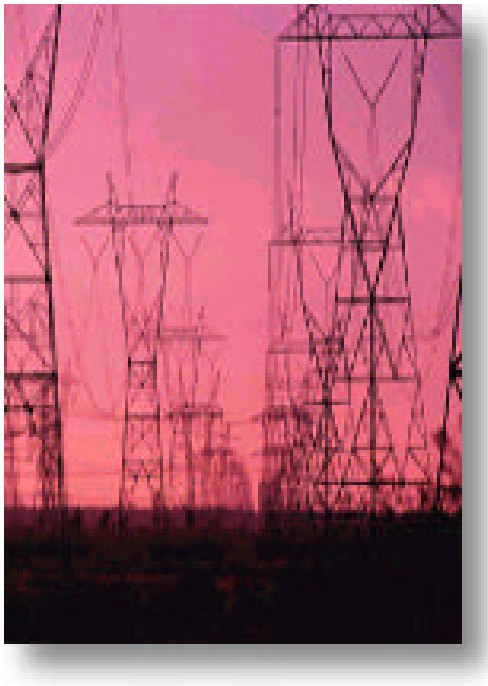
Annual Fly Ash and Bottom Ash Production (tons)	**520,500**
Ash disposal eliminated by installing demonstration plant* (tons)	**200,000**
Waste disposal cost savings	**$ 2 million**

Ash from the Ghent Power Plant was not marketed before the demonstration plant was installed because quality problems with both LOI and fineness eliminated any potential for sales.

* Only Unit 1 and Unit 2 will provide direct feed to the CUB Processing Plant. Ash from Unit 3 and Unit 4 will not be utilized.

Approach to Estimating Benefits

- **Forecast market penetration.**
  - Quantify the number of potential plants needed to support the Portland cement quantities



Assumed Market Penetration

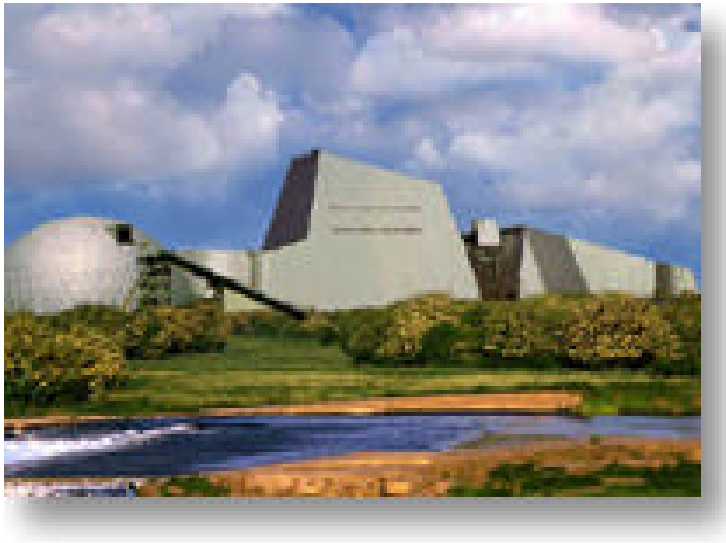
- **Market survey of potential buyers of the by-products produced was conducted.**
  - In Kentucky, the demonstration plant would be able to capture 13% of the total annual fly ash market of 2,280,000 tons, or 296,000 tons, which is almost double the tons of pozzolan expected from the plant.
- **Additional information was collected for Portland cement use in other states surrounding Kentucky.**
  - Total potential pozzolan use was calculated and estimates of the number of commercial sized plants that would be needed to support the 2001 Portland cement quantities reported in those states.

Assumed Market Penetration (cont'd)

Potential Markets by States	Fly Ash (Tons per Year)	Potential Plants
Florida	1,300,000	4
Alabama	264,000	1
Mississippi	158,000	0
Louisiana	303,000	1
Arkansas	161,000	1
Missouri	433,000	1
Indiana	373,000	1
Illinois	148,000	0
Ohio	660,000	2
TOTALS	3,800,000	11

Conclusions

- **There are significant benefits to the nation that will be realized by the commercialization of technologies being demonstrated in the Power Plant Improvement and Clean Coal Power Initiatives.**



Visit the NETL web site for information on all Power Plant Improvement Initiative and Clean Coal Power Initiative projects.

www.netl.doe.gov/coalpower/ccpi